CLAIMS

I claim:

[c1] 1. An aircraft system for moving a control surface between an extended position and a retracted position, the aircraft system comprising:

a drive shaft operably coupled to the control surface, wherein the control surface moves from the extended position toward the retracted position in response to rotation of the drive shaft about a longitudinal axis in a first direction;

a rotor operably coupled to the drive shaft and configured to rotate in response to rotation of the drive shaft in the first direction; and

at least one motion resistor operably engaging the rotor, wherein the rotor rotates with respect to the motion resistor when the drive shaft rotates in the first direction moving the control surface from the extended position toward the retracted position, and wherein the motion resistor resists rotation of the rotor as the rotor rotates with respect to the motion resistor.

[c2] 2. The aircraft system of claim 1, further comprising a sensor operably coupled to the motion resistor and configured to measure a force usable for determining the torque applied to the motion resistor as the rotor rotates with respect to the motion resistor and the control surface moves from the extended position toward the retracted position.

[c3] 3. The aircraft system of claim 1 wherein the motion resistor is configured to prevent rotation of the drive shaft in the first direction until a torque applied to the drive shaft is sufficient to overcome the motion resistor.

[c4] 4. The aircraft system of claim 1 wherein the motion resistor is configured to prevent rotation of the drive shaft in the first direction until a torque applied to the drive shaft is sufficient to overcome the motion resistor, and wherein the motion resistor is further configured to apply a resisting torque to the drive shaft that is at least approximately constant as the drive shaft rotates in the first direction moving the control surface from the extended position toward the retracted position.

[c5] 5. The aircraft system of claim 1 wherein the control surface moves from the retracted position toward the extended position in response to rotation of the drive shaft about the longitudinal axis in a second direction opposite to the first direction.

[c6] 6. The aircraft system of claim 1 wherein the rotor includes a first friction surface that is at least generally flat and the motion resistor includes a second friction surface that is at least generally flat, wherein the second friction surface operably engages the first friction surface when the rotor rotates with respect to the motion resistor and the drive shaft rotates in the first direction to move the control surface from the extended position toward the retracted position.

[c7] 7. The aircraft system of claim 1 wherein the rotor includes a first friction surface that is at least generally cylindrical and the motion resistor includes a second friction surface that is at least generally cylindrical, wherein the second friction surface operably engages the first friction surface when the rotor rotates with respect to the motion resistor and the drive shaft rotates in the first direction to move the control surface from the extended position toward the retracted position.

[c8] 8. The aircraft system of claim 1, wherein the control surface moves from the retracted position toward the extended position in response to rotation of the drive shaft about the longitudinal axis in a second direction opposite to the first

direction, and wherein the motion resistor resists rotation of the rotor when the drive shaft rotates in the second direction.

[c9] 9. The aircraft system of claim 1 wherein the control surface moves from the retracted position toward the extended position in response to rotation of the drive shaft about the longitudinal axis in a second direction opposite to the first direction, and further wherein the rotor is operably coupled to the drive shaft by a ratchet, the ratchet causing the rotor to rotate as the drive shaft rotates in the first direction, the ratchet allowing the rotor to remain stationary as the drive shaft rotates in the second direction.

[c10] 10. The aircraft system of claim 1, further comprising:

a sensor operably coupled to the motion resistor and configured to measure a force usable for determining the torque applied to the motion resistor as the rotor rotates with respect to the motion resistor and the control surface moves from the extended position toward the retracted position; and

a memory device operatively connected to the sensor and configured to record the torque applied to the motion resistor as the control surface moves from the extended position toward the retracted position.

[c11] 11. The aircraft system of claim 10 wherein the sensor is a force sensor.

[c12] 12. The aircraft system of claim 1 wherein the control surface is a trailing edge flap and the drive shaft is operably connected to the trailing edge flap.

[c13] 13. The aircraft system of claim 1 wherein the control surface is a leading edge slat and the drive shaft is operably connected to the leading edge slat.

[c14] 14. The aircraft system of claim 1, further comprising the control surface.

[c15] 15. The aircraft system of claim 1, further comprising:

the control surface;

a wing supporting the control surface; and

a fuselage fixedly attached to the wing.

[c16] 16. An aircraft control system comprising:

a drive shaft;

a power drive unit operably coupled to the drive shaft and configured to rotate the drive shaft about a longitudinal axis in a first direction and a second direction;

a rotor operably coupled to the drive shaft and configured to rotate in response to rotation of the drive shaft in at least the first direction;

a movable control surface operably coupled to the drive shaft, wherein rotation of the drive shaft in the first direction moves the control surface from an extended position toward a retracted position;

a brake including at least one motion resistor configured to operably engage the rotor and resist rotation of the rotor, wherein the rotor rotates with respect to the motion resistor when the drive shaft rotates in the first direction moving the control surface from the extended position toward the retracted position; and

a sensor operably coupled to the brake and configured to measure a force usable for determining the torque applied to the brake as the rotor rotates with respect to the motion resistor and the control surface moves from the extended position toward the retracted position.

[c17] 17. The control system of claim 16 wherein the brake further includes a body and a fitting, wherein the fitting is operably connected to the body and configured to at least generally prevent rotation of the body, and wherein the sensor is

operably coupled to the fitting and configured to measure a force applied to the fitting as the rotor rotates with respect to the motion resistor, the force being usable to determine the torque applied to the brake as the control surface moves from the extended position toward the retracted position.

[c18] 18. The aircraft system of claim 16 wherein the rotor includes a first friction surface that is at least generally flat and the motion resistor includes a second friction surface that is at least generally flat, wherein the second friction surface operably engages the first friction surface when the rotor rotates with respect to the motion resistor and the drive shaft rotates in the first direction to move the control surface from the extended position toward the retracted position.

[c19] 19. The control system of claim 16 wherein the power drive unit includes a hydraulic motor.

[c20] 20. An aircraft system for moving a control surface between an extended position and a retracted position, the aircraft system comprising:

a movable member operably coupled to the control surface, wherein the control surface moves from the extended position toward the retracted position in response to translation of the movable member in a first direction; and

a brake configured to resist translation of the movable member in the first direction when the control surface is in the extended position, and wherein the brake is further configured to resist translation of the movable member in the first direction as the control surface moves from the extended position toward the retracted position.

[c21] 21. The aircraft system of claim 20 wherein the brake is configured to resist translation of the movable member in the first direction by applying a frictional force to a friction surface operably coupled to the movable member.

[c22] 22. The aircraft system of claim 20, further comprising a sensor operably coupled to the brake and configured to measure a force applied to the brake as the control surface moves from the extended position toward the retracted position.

[c23] 23. The aircraft system of claim 20, further comprising:

a sensor operably coupled to the brake and configured to measure a force applied to the brake as the control surface moves from the extended position toward the retracted position; and

a memory device operatively connected to the force sensor and configured to record the force applied to the brake as the control surface moves from the extended position toward the retracted position.

[c24] 24. The aircraft system of claim 20, further comprising:

the control surface;

a wing supporting the control surface; and

a fuselage fixedly attached to the wing.

[c25] 25. A method for operating an aircraft control surface, the method comprising:

activating a control system to move the control surface from a retracted position to an extended position;

applying a brake to the control system to at least restrict motion of the control surface away from the extended position;

activating the control system to move the control surface from the extended position to the retracted position; and

while the control surface is moving from the extended position to the retracted position, continuing to apply the brake to the control system to resist the movement of the control surface from the extended position to the retracted position.

[c26] 26. The method of claim 25 wherein applying a brake to the control system to at least restrict motion of the control surface away from the extended position includes holding the control surface in the extended position.

[c27] 27. The method of claim 25 wherein applying a brake to the control system to at least restrict motion of the control surface away from the extended position includes resisting rotation of a rotor operably coupled to the control surface.

[c28] 28. The method of claim 25 wherein activating a control system to move the control surface from a retracted position to an extended position includes applying a first torque to a drive shaft operably coupled to the control surface, and wherein activating the control system to move the control surface from the extended position to the retracted position includes applying a second torque to the drive shaft, the second torque being greater than the first torque.

[c29] 29. A method for testing a control system brake on an aircraft, the method comprising:

activating a control system in a first mode to move a control surface from a retracted position to an extended position;

applying the control system brake to the control system to at least generally hold the control surface in the extended position;

activating the control system in a second mode to move the control surface from the extended position to the retracted position;

while the control surface is moving from the extended position to the retracted position, continuing to apply the brake to the control system to resist the movement of the control surface from the extended position to the retracted position; and

measuring a load applied to the brake as the control surface moves from the extended position to the retracted position.

[c30] 30. The method of claim 29 wherein the control system brake is configured to withstand a predetermined load prior to permitting the control surface to move from the extended position to the retracted position, and wherein the method further comprises comparing the measured load to the predetermined load to determine a status of the control system brake.

[c31] 31. The method of claim 29 wherein the control system brake is configured to withstand a predetermined load prior to permitting the control surface to move from the extended position to the retracted position, and wherein the method further comprises comparing the measured load to the predetermined load to determine the remaining useful life of the control system brake.

[c32] 32. The method of claim 29 wherein the control system brake is configured to withstand a predetermined load prior to permitting the control surface to move from the extended position to the retracted position, and wherein the method further comprises comparing the measured load to the predetermined load to determine a service schedule for the control system brake.

[c33] 33. The method of claim 29 wherein measuring the load applied to the brake as the control surface moves from the extended position to the retracted position includes measuring a first load, and wherein the method further comprises:

measuring a second load on the control system when the control system is in the extended position; and

comparing the first load to the second load to determine a status of the control system brake.

[c34] 34. The method of claim 29, further comprising flying the aircraft, wherein activating the control system to move the control surface from the extended position to the retracted position includes moving the control surface from the extended position to the retracted position while the aircraft is flying.